

Promises and Perils of Lycopene/Tomato Supplementation and Cancer Prevention

A Research Agenda for Lycopene/Tomato Supplementation and Cancer Prevention¹

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Many consumers believe, whether factual or not, that tomatoes and/or lycopene protect against cancers at several sites and most notably that occurring in the prostate. The workshop, "Promises and Perils of Lycopene/Tomato Supplementation and Cancer Prevention" was held to summarize the science that relates to the anticancer properties of this food and one of its bioactive food components. A major goal of the workshop was to identify research gaps that could help identify research priorities. Following is an incomplete list of some of the issues that emerged during the meeting and recommendations proposed by the meeting participants. The order of headings and listing does not imply either priority or group consensus.

Vulnerable populations

- Identify populations (if any) that may benefit or be placed at risk with modification in tomato/lycopene intake. Specifically, examine genetic susceptibility and antioxidant status as variables.
- Investigate the effects of supplemental lycopene in individuals undergoing radiotherapy, chemotherapy, or other drug therapy, or who have undergone androgen ablation.
- Identify confounders of the biological response to tomatoes/lycopene, including dietary variables and lifestyle factors such as smoking and alcohol.

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- Conduct sufficiently powered and well-designed clinical studies.

Exposures

- Improve assessment tools for estimating tomato/lycopene intake.
- Include bioavailability in the assessment of tomato/lycopene exposure.
- Characterize the importance of the quantity and duration of consumption needed to optimize blood and tissue lycopene concentrations.

Mechanisms and biomarkers

- Expand the use of transgenic and knockout models to identify molecular targets.
- Clarify the uniqueness of lycopene for explaining the effects of tomato consumption, determine whether tomato components other than lycopene are involved, and evaluate whether lycopene interacts synergistically with these components and/or other antioxidant nutrients.
- Establish what factors regulate the differential uptake and accumulation of tomato carotenoids among tissues; evaluate the mechanisms by which specific chemical species (all *trans* versus *cis* isomers and metabolic products) of lycopene localize in cells and tissues.
- Utilize various "omics" technologies (i.e., transcriptomics, proteomics, metabolomics) to elucidate the mechanisms of action of tomatoes/lycopene both in animal models and in diseased/nondiseased tissues of human subjects.
- Identify surrogate endpoint biomarkers for pathways influenced by tomatoes/lycopene.
- Evaluate whether tomatoes/lycopene would be more beneficial for androgen-dependent or androgen-independent cancer.